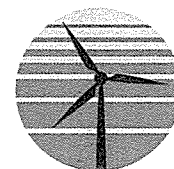


OUR PLANET NEEDS ENERGY NOW



Liquid Natural Gas: A roadblock to a clean energy future



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About Greenpeace

Since 1971, Greenpeace has been a leading voice for the environmental movement. Greenpeace works around the world to protect oceans and ancient forests, and to fight toxic pollution and genetic engineering, global warming and nuclear threats. Without compromise, Greenpeace takes on powerful political and corporate opposition to protect the future of our planet.

Liquid Natural Gas: A roadblock to a clean energy future

Over the past few years, fueled by rising natural gas prices, some of the world's largest multinational corporations began searching for new sites for Liquid Natural Gas (LNG) terminals. Very early in this process these corporations identified the Northern most State in Mexico, Baja California, as a prime target for LNG development.

Hoping to avoid strict environmental laws and local opposition to coastal development in California, yet still have easy access to the United States, corporations like Semptra, Shell, ChevronTexaco, Marathon and ConocoPhillips proposed LNG terminals on the Baja California coast, just South of the California border. The first proposed projects, which were inappropriately located in residential neighborhoods, were driven away by local residents who feared for the safety of their families. However, two environmentally and socially flawed projects remain on the Baja California coast.

The first, a joint project of Semptra and Shell, is currently proposed near a resort community on a pristine stretch of the Baja California coast. The environmentally destructive terminal would use millions of gallons of seawater every day, potentially impede migrating whales, and put the safety of the local retirement community at risk.

ChevronTexaco has proposed a second terminal on the Coronado Islands eight miles off the coast. ChevronTexaco was handed the lease for the islands in a midnight deal that has angered residents and politicians equally. The project would endanger the bountiful wildlife on the island and could also impede whale migration.

The construction and operation of the LNG terminals in Mexico will degrade the environment and the Semptra/Shell terminal will put local communities at substantial risk in the event of a major accident or terrorist attack. But, it doesn't have to be that way. Now is the time to shift away from dangerous dependence on fossil fuels and towards global investments in renewable energy, conservation and energy efficient technologies.

Greenpeace is asking that:

1. California policy makers not commit the state to long-term contracts to Liquid Natural Gas from either Mexico or California.
2. Multinational companies and the governments of California and Mexico invest in clean energy technologies, such as wind and solar power, creating good local jobs without risking the public's health and safety.

Derailing California and Mexico Clean Energy Commitments

The fast tracking of LNG within the California government threatens the tremendous strides that the renewable energy industry had made in the State. Efforts are underway within the State of California to promote LNG over energy efficiency and renewable energy resources in conflict with the official policy of the State articulated only two years ago in the Energy Action Plan.

There is no reason to fast-track LNG investments. California can meet its future energy demands without building any LNG terminals. If the State pursues aggressive energy efficiency goals, retrofits the old inefficient coastal power plants, and expands the States renewable energy goals, the State can reduce natural gas demand by one-third, the equivalent of three LNG terminals.

California can reduce natural gas demand by one-third

Gas Demand, Projected Demand Increase by California Natural Gas Utilities, Supply/Demand Reduction Options	Gas Quantity (mmcf/d)
Average daily natural gas use in California, 2001	6,600
Projected increase in gas demand over 2002 baseline, 2006-2016	0-200 ¹
Average projected daily natural gas delivery from one LNG terminal	700-800
Total Reduction in California gas demand from conservation measures and accelerated renewable portfolio standard (20% by 2010)	1,100 – 1,500 ²
Total Reductions assuming 30 percent renewable portfolio standard (a)	1,800 – 2,300 ³

Source: Synapse Energy Economics, 2004

(a) Estimated from CEC baseline.

The development of LNG infrastructure in California and Baja California threatens the State's ability to combat global warming. The use of natural gas that has been liquefied and transferred across the Pacific reduces the difference between natural gas power plant CO₂ emissions and coal power plant emissions by nearly half. Yet more importantly, by reaching beyond the traditional boundaries of North America to South America, Russia and the Far East, the development of LNG terminals on the West Coast would open up nearly limitless quantities of natural gas to the energy markets in those states. This shift threatens to turn natural gas, previously viewed as a "transitional" fuel, into a permanent source of global warming gasses.

¹ Derived from presentations by PGE, SoCalGas, and SDGE at CEC/CPUC Natural Gas Workshop, Dec. 9-10, 2003. 2006-2016 demand increase in SoCalGas/SDGE territory: 0 mmcf/d. In PGE territory: 0-200 mmcf/d.

² Derived from Synapse Energy Economics evaluation submitted in March 23, 2004 RACE coalition comments in CPUC Utility Long-Term Natural Gas Procurement Proceeding, Rulemaking 04-01-25

³ Derived from Synapse Energy Economics evaluation submitted in March 23, 2004 RACE coalition comments in CPUC Utility Long-Term Natural Gas Procurement Proceeding, Rulemaking 04-01-25

In Baja a renewable energy developer Fuerza Eolica is planning to build a 340 MW wind farm on Mexican side of the California border. This wind power, when combined with an upgrade of Cerro Prieto, would produce enough power to eliminate the need for the inefficient gas/oil burning state owned power plants in Rosarito. But those investments are unlikely if even one of the LNG terminals in Baja California and signs long term contracts for all of the State's natural gas needs.

Time Bomb or Terrorist Target?

As the number of proposed LNG facilities in North America has grown to national prominence, so have the safety concerns. These concerns were escalated after a study by the Algerian government into an accident at a LNG terminal indicated that LNG leak was responsible for the explosion. Additional concerns over the cost and feasibility of protecting an LNG terminal in Boston, which was closed again during the Democratic Convention, are spilling into the debate over costs and dangers at facilities across the United States and into Mexico, where politicians are debating who will ultimately pay for security at LNG facilities in Baja California.

It is likely that accident and terrorism safeguards will be updated in the United States to reflect new information and concerns since September 11th. But it remains to be seen whether these efforts will extend south of the border into Mexico. Neither Semptra/Shell nor Chevron-Texaco has indicated that they intend to implement any additional safety or security measures.

LNG's Global Blood Trail

Greenpeace and other environmental and social justice groups are currently opposing the development of LNG facilities on the West Coast. We stand together in an effort to protect not only the communities both in California and Mexico, but also the impacted communities around the world. From the partially contact indigenous communities in Peru to the residents of war torn Indonesia, to Sakhalin Island in Russia, the expansion of the Oil and Gas industry into new and sensitive areas represents a global threat for which the governments of the world are ill prepared.

Chapter 1. A New Global Warming Challenge

Global warming threatens to devastate the world's natural climate system. Over the past century, the earth's surface temperature has risen by about one degree Fahrenheit, and mounting evidence indicates that most of the recent warming can be attributed to human activities, such as the burning of oil, coal and gas. While a rise in temperature of just one degree may not sound threatening, that change in temperature is enough to cause unpredictable weather patterns with devastating results. Global warming is implicated for intensifying extreme weather conditions such as floods, droughts, wildfires, hurricanes and heatwaves and causes problems ranging from the spread of infectious diseases to the destruction of power lines and crops. The impacts of global warming not only impact our health; they also result in billions of dollars of expenses for relief efforts and insurance costs.

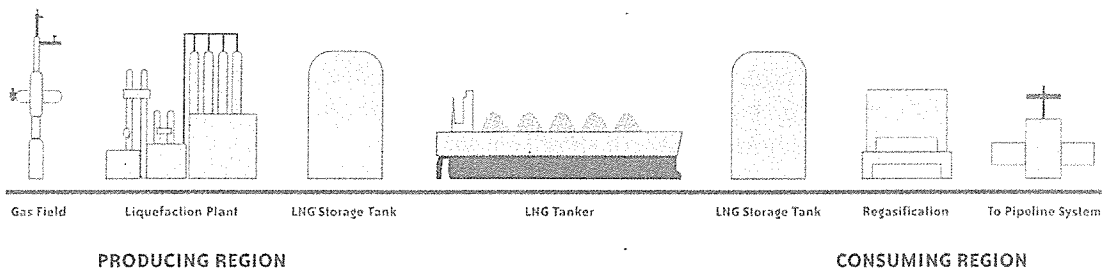
The burning of coal, gas and oil releases carbon dioxide (CO₂) into the atmosphere, which is the primary cause of global warming. The United States is responsible for over a quarter of the world's carbon emissions, while representing only four percent of the global population. Instead of spending billions of dollars increasing dependency on fossil fuels (coal, gas and oil), the U.S government and powerful oil companies should invest in alternative, renewable sources of energy. The current trend towards an increased dependence on Liquid Natural Gas (LNG) is frightening because it increases reliance on environmentally destructive fossil fuels and significantly delays the possibility of moving towards renewable energy sources by creating a costly infrastructure for LNG. This is especially true of the West Coast of North America which, unlike the East Coast, currently has no LNG terminals or LNG infrastructure.

This report analyzes the impacts of two proposed LNG regasification sites on the environment and local communities of Baja California and the Coronado Islands in Mexico. The construction and operation of the LNG regasification terminals at these sites will both severely degrade the environment and put existing local communities at substantial safety risk in the event of a major accident or terrorist attack. But, it doesn't have to be that way. Now is the time to shift away from dangerous dependence on fossil fuels and towards global investments in renewable energy, conservation and energy efficient technologies.

What is liquid natural gas (LNG)?

Liquid Natural Gas (LNG) is the liquid form of natural gas. In a process called liquefaction, natural gas is condensed at minus 260 degrees Fahrenheit. Liquefaction greatly reduces the volume of natural gas making it economically feasible to transport LNG great distances via special tankers. The tankers deliver the LNG to receiving terminals, such as those proposed in Baja California, where the LNG is converted back to natural gas and delivered to customers. The creation of this LNG receiving infrastructure

will increase the United States' and Mexico's dependence on foreign fossil fuels and open up Mexico's energy market to exploitation by multinational corporations.



Shell/Sempra LNG terminal in Baja California

Shell International Gas Limited and Sempra Energy LNG Corp have jointly proposed a Liquid Natural Gas (LNG) receiving terminal in Baja California¹. The two companies will own and operate the \$600 million facility. The proposed location for the terminal is on the Costa Azul in Mexico, 23 km Northwest of the city of Ensenada. The terminal has a designed natural gas delivery rate of 1000 million cubic feet per day (mmcf/d).² A 64 km pipeline will stretch northwards from the terminal to the Industrial Park, El Florido, in the municipality of Tijuana.

The Baja California site was chosen after evaluation of potential coastal sites near the U.S. border. The final decision was made based on zoning, proximity to population centers, and proximity to deep water. The Shell/Sempra LNG terminal will be located within 2 miles of one of the most of the popular tourist resorts, Bajamar. The associated pipeline will pass through an inland route that avoids residences, but has a more negative environmental impact as compared to other proposed routes.

The Baja California LNG terminal will occupy 40 acres of coastal land, with 24 additional acres being used for the service road. It will take three and a half years to construct, requiring approximately 1,000 construction workers. Construction of the pipeline will disrupt nearby communities and will take one year to complete. After construction, 30-40 technical workers will be required to operate the facility. It is likely that already trained individuals will fill all of the higher-paid, skilled positions. Members of the local community are not likely to fill these higher-paying jobs. In addition, 35 contract workers will be hired for services such as security, catering, cleaning, and maintenance.

The terminal will unnecessarily harm the coastal environment. Shell and Sempra plan to use at least 100 million gallons per day of seawater to regasify the LNG at the terminal. This process is expected to kill 100 percent of any sea life entrained in the seawater used for regasification.³

There is concern that construction will destroy archeological remains dating back thousands of years. The archeologists who conducted the review are scrambling to study the site before the evidence is lost forever.

Chevron-Texaco Proposed LNG terminal at the Coronado Islands⁴

Chevron-Texaco has proposed an offshore LNG terminal that will use oil and gas industry technology to construct a receiving and regasification site in 20 meters of water, 13 km off the coast of Tijuana, Mexico. The terminal will have an average capacity of 700 mmcf.⁵ The LNG terminal will be located just 600 meters east of the Coronado Islands and will cost \$650 million dollars to build. Construction will last at least three years and is expected to require 1,200 construction workers.

The offshore LNG terminal at the Coronado Islands will receive LNG from a ChevronTexaco-owned exploitation site located in the Gorgon gas fields off the coast of Western Australia. The site of the proposed ChevronTexaco LNG liquefaction plant in Barrow Island, Australia is highly controversial due to the unique habitat Barrow Island provides for a number of unique or endangered species. The LNG receiving terminal off the Baja California coast will have the capacity to store 250,000 cubic meters of LNG. The LNG will be warmed using seawater and then shipped through a new underwater pipeline that will join Baja California's existing energy infrastructure. The gas will be available to customers in Northern Baja California and throughout the West Coast of the U.S.

The offshore site was chosen based on the natural breakwater provided by the Coronado Islands. Another consideration was the distance that an offshore site provided from residential communities. The site is within 600 meters of the Coronado Islands, critical habitat for a number of marine bird species. A major concern is the impact of lights from the terminal on birds nesting on the island.

How does LNG contribute to global warming?

LNG uniquely increases the emissions of CO₂ into the atmosphere. The composition of natural gas emissions are identical whether it has been converted to LNG or burned straight from gas. However, the processes necessary to convert and transport LNG are energy intensive. As shown in Table 1, the process of converting natural gas into a liquid, transporting it across the Pacific Ocean, and then returning it to its gaseous form, known collectively as the "LNG supply chain," requires an increased natural gas consumption of 18-22 percent.⁶ An additional 11 to 18 percent increase in CO₂ emissions is likely to occur because of high CO₂ content in the raw source gas being converted to LNG and exported to Mexico.⁷ The CO₂ in the source gas may be vented to atmosphere during processing.

The combined impact of venting CO₂ during processing and the energy penalty of the LNG supply chain would increase CO₂ emissions by roughly 20 to 40 percent over California's current emissions from domestic sources of natural gas (see Table 1). This increase significantly closes the gap between coal and natural gas with respect to global warming gases.

Table 1. Transportation of liquid natural gas to California would significantly increase greenhouse gas emissions

<u>Process Step</u>	<u>Additional Gas Use (Percent)</u>
Domestic Natural Gas	Basecase
Liquification	9 – 10
Transport	7 – 9
Regasification	2 – 3
Carbon Dioxide in Gas	0 – 18
Total Additional Gas Consumed	18 – 40

Source: Powers Engineering 2004, June 1, 2004 Global LNG Summit presentation.

The coal industry claims that LNG increases gas consumption by 30 percent⁸ over natural gas for the liquefaction and regasification alone which is nearly three times the Powers Engineering estimate. The discrepancy stems from the age and thus efficiency of the LNG infrastructure. The Powers Engineering study assumes the most efficient technology available, while the coal industry used the current condition of plants when conducting its study.

The net result of the increase in global warming emissions is that natural gas power plants burning high CO₂ natural gas that has been shipped as LNG to California would have a global warming impact that falls in-between coal and domestic natural gas (see Table 2). In other words, LNG power plants will only reduce global warming pollution by about half as much as a domestically produced natural gas versus current electricity from coal. Given the tremendous worldwide reserves of natural gas that could be shipped to developed countries for decades, this difference is significant.

Table 2. Liquid natural gas power plants

<u>Power Plant Type</u>	<u>Global Warming Gas Pollution</u>
Natural gas – low CO ₂ domestic gas	400 g/Kwh
Liquid Natural Gas	480 g/Kwh
Liquid Natural Gas – high CO ₂ (a)	560 g/Kwh
Coal – Advanced IGCC	660 g/Kwh (b)
Coal – pulverized coal	770 to 830 g/Kwh (c)

Source: <http://www.ieagreen.org.uk/sr1p.htm>

(a) Assumes a 40 percent increase in CO₂ emissions, see above.

(b) Three demonstration integrated gasification combined cycle (IGCC) plants exist in the U.S. Gasification plants turn coal into gas, and are touted as the next generation of coal-burning power plants, but have not been embraced by industry. Assumes a 50 percent thermal efficiency.

(c) Half of U.S. electricity is generated from pulverized coal. Assumes 40 – 43 percent efficiency.

Because of the small difference between LNG and coal power plants, renewable energy and conservation investments are much more effective in slowing global warming and produce a multitude of co-benefits. California's natural gas demand can be reduced by 2,300 mmcf/d through conservation and renewable energy measures, avoiding the emission of 100 billion pounds of CO₂ per year. This would reduce California's natural gas consumption by a third, and the equivalent of removing more than 10 million passenger cars per year from the road.¹

The proposed LNG terminals will serve U.S. demand almost entirely

While the two proposed LNG sites in Baja California will primarily serve the California market, both Shell/Sempra and Chevron-Texaco claim that these plants will eventually also provide LNG in quantity to the Baja California market. The Mexican government has stated that the terminals built in Mexico will serve the U.S. market. A report presented by the Mexican Secretary of Energy, Felipe Calderon Hinojosa, states, "Mexican LNG terminals could supply directly to the south of the United States."²

Sempra Energy continues to assert that it will sell the majority of the natural gas from its LNG terminal to Mexico. In response to Greenpeace's request for information, a Sempra official stated "[Greenpeace's letter] incorrectly stated that Energia Costa Azul is being built solely for the benefit of the United States. In fact, when our facility is completed in 2007, we expect that Mexico will consume about half of the gas from the plant and virtually all of the output by the middle of the next decade."³

A review of the natural gas use in Baja California shows that the demand is nowhere near the proposed LNG supply, and shows that Baja California could only use a fraction of the natural gas that one LNG terminal would provide. The peak amounts of natural gas used in Baja California, excluding the power plants that serve the U.S. market, is approximately 250 mmcf/d when all the power plants are running. The average natural gas use is considerably less, in the range of 150 to 200 mmcf/d. The Shell/Sempra LNG terminal will have a peak capacity of 1,300 mmcf/d. The Chevron-Texaco site at the Coronado Islands will have a capacity of 1,000 mmcf/d.⁴

No new power plants are currently proposed or under construction in Baja California. The typical lead-time between permit application and an operational project is at least three years. There will be no new large natural gas customers in Baja California when the proposed Costa Azul and Coronados Islands terminals begin operation in 2007. Power plants serving the Baja California market are also served by existing long-term natural gas contracts. As shown in Table 3 below, less than 10 mmcf/d of the planned

¹ Environmental Protection Agency (assumes auto emissions of 10,000 pounds of CO₂ per year).

² Hinojosa, Felipe Calderon, Secretary of Energy, Mexico. "Opportunities for LNG Terminals in Mexico." *LNG Ministerial Summit December 2003*. Available from <http://www.usea.org/lngsummitpresentations.htm>

³ May 21, 2004, from Michael J. Murray of Sempra

⁴ California Energy Commission, March 2004.

output of 2,300 mmcf/d, or less than one percent, could be purchased directly for use in Baja California in 2007.

Table 3. Mexico's natural gas demand is far less than LNG output

Power Plant/Industry	Capacity MW	Daily gas use (mmcf/d) (a)	Contract Expires	Power Use
CFE Rosarito	550	64	2010 (b)	Mexico
Intergen	500	58	2013	Mexico
CFE Rosarito (gas/oil)	650	120	2010	Mexico
Mexicali Local Use	NA	<10	Unknown	Mexico
Subtotal Mexico	1,700	252		
Intergen	560	70	No	California
Sempra Mexicali	650	76	No	California
Subtotal California Export	1,210	146		
Total	2,910	398		

(a) assumes an annual capacity factor 70 percent

(b) Available from <http://www.sempratradng.com>

The lack of natural gas infrastructure and demand in Baja, along with the fact that California ratepayers are being asked to bear the burden of \$200 million in costs to modify the SDGE natural gas pipeline transmission system, indicates that much of the Baja California LNG supply is expected to serve the California market. The \$200 million in pipeline upgrades is needed to reverse flow and allow the importation of large quantities of natural gas from LNG terminal(s) located in Baja California to the U.S market.

Renewable Energy Options for Baja California

The opportunity cost of fostering dependency on natural gas in Mexico is enormous. Northern Baja California currently meets about 40 percent of its electricity requirements through geothermal plant, Cerro Prieto. Cerro Prieto currently produces 720 MW and has the potential to reach 1,500 MW⁹. Additionally, clean energy production from solar and wind energy technologies have tremendous potential in Baja California. The mountainous area between Tijuana and Mexicali includes some of the best sites in Mexico for producing wind energy. A prime site for solar power production, there are an average of 290 sunny days per year in Baja California, with seven hours of sunlight per day.

In Baja, Fuerza Eolica is planning to build an additional 340 mw of wind power on Mexican side of the California border. This wind power, when combined with an upgrade of Cerro Prieto, would produce enough power to eliminate the need for both CFE power plant in Rosarito, and would easily replace the inefficient gas/oil plant.

There is also tremendous demand for renewable energy in Mexico. A poll completed by the Commission for Environmental Cooperation found that 94 percent of energy buyers in Mexico would like to purchase renewable energy, and 90 percent would accept a requirement that they purchase renewable energy.¹⁰

Table 4. Renewable Energy Options for California and Baja California¹¹

Energy Options (a)	Cost (\$/kwh) (b)
Natural gas combined-cycle power plant (baseload)	0.05
Natural gas simple cycle power plant (peaking)	0.16
Wind	0.05
Solar Photovoltaic (residential) (f)	0.25
Solar thermal (residential)	0.14-0.17
Geothermal (flash)	0.05
Energy conservation (c)	0.03-0.06
San Diego Gas and Electric 2004 residential charge	0.15 (d)
CFE, North Baja California 2004 residential charge	0.22 (e)

(a) California Energy Commission, *Comparative Cost of California Central Station Electricity Generation Technologies*, August 2003, page 3 and 11.

(b) "levelized direct cost"—assumes life of project natural gas cost in \$5/MMBtu to \$6/MMBtu range.

(c) California Consumer Power and Conservation Financing Authority, "Clean Growth: Clean Energy for California's Economic Future- Energy Resource Investment Plan." February 2002, Table 6-2, pg.54.

(d) Includes only metered kwh usage charge and "electric energy charge", April 2004.

(e) Includes only December 2003 published CFE summer usage charge based on 1,000 kwh/month.

(f) California Energy Commission, Energy Power Calculator; SEIA cost calculations.

The combination of renewable energies in Mexico could produce at least 50 million to 100 million MWh of energy.¹² In southern California, the unsubsidized price for residential solar power is approximately 25 cents per kwh.¹³ The current residential power rate in Baja California is 22 cents per kwh (see Table 4). This difference is negligible when the cost of environmental degradation and safety issues associated with LNG are included.

Mexico has tremendous potential for solar thermal energy. A report by the European Solar Thermal Industry Association and Greenpeace states that with the right incentives and policies Mexico could generate 1,290 MW of power at solar power stations by 2015.¹⁴

Mexico also has great potential for energy efficiency, the Mexico's Comisión Nacional para el Ahorro de Energía (CONAE) estimated that Mexico can reduce energy consumption by 20 percent, saving the country 100,000 million pesos every year.

¹ Available from www.shell.com

² California Energy Commission, *West Coast LNG Projects* April 29, 2004.

³ July 15, 2003 envr coalition comment letter on USCG DEIS for ChevronTexaco Port Pelican offshore LNG project, Gulf of Mexico.

⁴ Available from www.chevrontexaco.com

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- ⁵ California Energy Commission, *West Coast LNG Projects*, April 29, 2004.
- ⁶ B. Powers, July 6, 2004 PowerPoint presentation to CalEPA, Sacramento.
- ⁷ Both the Gorgon gas field (NW Australia, source of ChevronTexaco LNG) and the Tangguh gas field (Indonesia, source of Sempra/Shell LNG) are high in CO₂.
- ⁸ Coal Industry: Utility Fax Alert #681, July 9, 2004.
- ⁹ Conversations with Alejandro Abril, Director of CFE Geothermal Projects
- ¹⁰ http://www.cec.org/files/PDF/ECONOMY/breceda_es.pdf
- ¹¹ Powers Engineering, "Worldwide View of Global Supply Chains" *Global LNG Summit* June, 2004.
- ¹² Munoz, Enrique Caldera. "Potencial de la Energia Eoloelectrica en Mexico," Investigacion elaborada para Greenpeace Mexico, 1999.
- ¹³ California Energy Commission, Clean Power Estimator.
- ¹⁴ Greenpeace, Solar Thermal Power: 2020 Exploiting the Heat From the Sun to Combat Climate Change.

Chapter 2. Time Bomb or Terrorist Target

As the increasing number of proposed LNG facilities in North America has grown to national prominence in the United States, so have the safety concerns. These concerns escalated after a study by the Algerian government into an accident at a LNG terminal indicated that LNG vapor was responsible for the explosion. In addition, concerns over the cost and feasibility of protecting an LNG terminal in Boston is spilling into the debate over costs and dangers at facilities across the United States and into Mexico, where politicians are debating who will ultimately pay for security at LNG facilities in Baja California.

It is likely that accident and terrorism safeguards will be updated in the United States to reflect new information and concerns since September 11th. But it remains to be seen whether these efforts will extend south of the border into Mexico. Neither Sempra/Shell nor Chevron-Texaco has indicated that they intend to implement any innovative safety or security measures.

A recent accident in Algeria raises new questions about the safety of LNG

The LNG industry claims that new LNG facilities are no longer dangerous. They claim that the disaster in Cleveland in 1944 that killed 128 people, and the non-fatal vapor cloud releases in Boston in 1988 and the UAE in 1978, are problems of the past. But the fatal January 2004 accident that destroyed a good portion of an Algerian LNG liquefaction plant indicates that the industry has not solved its safety problems and provides dramatic evidence that these facilities should not be located near people.

The new report by the Algerian government, presented at a LNG conference in Qatar in March 2004, states that “large amount of liquid gas escaped from a pipe and formed a cloud of highly flammable and explosive vapor that hovered over the facility. The cloud exploded after coming into contact with a flame source.” According to leading LNG safety experts, the accident in Algeria could occur at plants like the ones being proposed in Baja Mexico.¹

Multinational companies move LNG terminals to Mexico to avoid U.S. opposition

The safety concerns that LNG sites invite are one of the reasons that people across the U.S have fought to ensure that LNG facilities are not built in their cities. The Mayor of Boston, Thomas M. Menino, sued to keep LNG tankers out of Boston harbor after the Sept. 11 attacks. Menino lost that court fight but maintains LNG tankers should not enter metropolitan areas due to safety concerns. Boston fire officials told a state panel in February 2004 that they remain unprepared to deal with the potential disaster stemming from an explosion aboard one of the giant tankers that carries LNG through Boston Harbor.²

Massive security measures are now involved in bringing each LNG tanker into Boston. Since Sept. 11 at least a dozen vessels clear a safety and security zone two miles ahead and one mile behind the ship - and the Coast Guard also inspects the tankers offshore. The security measures taken to guard LNG related equipment from terrorist attacks in the U.S demonstrate an implicit recognition of the extreme potential danger that LNG terminals create no matter where they are constructed.

LNG terminals have been defeated in Vallejo (California), Oxnard (California), Eureka (California), Harpswell (Maine), Mobile (Alabama), Tijuana and Rosarito, (Mexico). All of these proposed sites were withdrawn when local residents declared that they did not want the LNG terminals in their communities. These communities cited "serious safety concerns"³ as their reason for refusing these LNG terminals. Successes in these seven cities demonstrate that local resistance is an effective means of preventing poorly sited LNG terminals from being completed.

LNG facilities pose a terrorist and safety threat to local communities

A recent report of the U.S. Congressional Research Service identified LNG terminals, tankers and pipelines as prime terrorist targets. In the United States, federal warnings about Al Qaeda threats since September 11, 2001 have repeatedly mentioned energy infrastructure. On the morning of Sept. 11, 2001, top officials in the White House situation room expressed an almost immediate fear of an attack on the Boston LNG plant, according to the former White House terrorism chief Richard A. Clarke.⁴

The Congressional Research Service report outlines the potential for an attack on LNG facility as a "serious hazard." Although there has not yet been a terrorist attack on LNG tankers or land-based facilities, gas and oil pipelines and oil tankers have been attacked in at least six countries, including the 2002 attack on the French oil tanker *Limberg* off the Yemeni coast by a bomb-laden boat.⁵ Paul W. Pafomak explains why LNG tank facilities may be targeted; "because LNG infrastructure is highly visible and easily identified, it is also potentially vulnerable to terrorist attack...LNG is inherently volatile and is usually shipped and stored in large quantities."⁶

Potential hazards include pool fires, which occur when combustible gas-air mixture burns above a pool of leaked LNG. "Such pool fires are intense, burning far more hotly and rapidly than oil or gasoline fires," the report adds. "Many experts agree that a pool fire, especially on water ... is the most serious LNG hazard."⁷ It is also the consensus that such a fire could not be extinguished.

If LNG were released in an attack, it would most likely ignite immediately. However, if the LNG escaped without catching fire, a cloud of the gas could drift elsewhere and cause a fire; according to the report. Beyond physical damage, an attack on a LNG facility, especially one serving a large percentage of the population of California, could have a tremendous ripple effect on the California economy.

In Alabama, a similar LNG terminal proposal for the City of Mobile led the *Mobile Register* to conduct research, which it claimed “revealed significant flaws in the research used by the (federal) government when approving the construction of such facilities.” Leading LNG scientists warned that an accident or terrorist attack involving a tanker could lead to a fire a mile wide, inflicting second-degree burns on people two miles away,” leading to overwhelming local public opposition to the \$600 million ExxonMobil proposal.⁸

A study by Lloyd's Register of Shipping presents a chilling examination of what might happen if a terrorist attacked a LNG tanker. According to the study, terrorists who blew relatively small holes in the inner and outer hulls of a LNG tank could trigger an escalating series of explosions and fires. The ship, said the Lloyd's study, “would become a total loss with a continuous fire that would be inextinguishable until all gas had been consumed.”⁹

James A. Fay, professor emeritus at the Massachusetts Institute of Technology, a leading expert on LNG and former chairman of the Massachusetts Port Authority board, believes a boat bomb, like the one used against the USS Cole in 2000 or the French oil tanker *Limburg* in 2002, would cause at least half of the ship's cargo to seep over the water and ignite in a raging blaze. “There's no doubt that with a big enough bomb you can blow a hole in the side of the vessel and the cargo will burn,” Fay said. “It's well understood that for the big fires we're talking about that distances like half a mile or so, you can get second-degree burns to exposed skin in about 30 seconds...”¹⁰

“In just over three minutes, the fire could spread two-thirds of a mile from the ship. There is nothing safety officials can do in such a case. They would have no time to evacuate people or to put out the fire.... Like the attack on the World Trade Center in New York City, there exists no relevant industrial experience with fires of this scale from which to project measures for securing public safety.”¹¹

Jerry Havens, a University of Arkansas professor and expert in both fires and weapons of mass destruction, agrees with Fay's assessments. Haven's concern is primarily with the lack of security measures required in the transport of LNG. In testimony before the House Subcommittee on Energy Reforms given on June 22, 2004, he commented that spills from a LNG tanker could require an exclusion zone of several miles in order to protect the public. He also emphasized that “present regulations do not require the address of spills from a tanker at the facility”.¹² Dr. Havens agrees with the findings of Lloyd's Register and is also concerned that the entire tanker could be lost in fire if attacked, a concern that has recently been validated by consultants to the Federal Energy Regulatory Commission (FERC).

New studies indicate need for larger safety zones

The FERC has received important new evidence regarding the safety of LNG tankers. On May 13, 2004, FERC's consultant, ABS Consulting, Inc, found that the 2001 LNG

hazard study previously relied on by the FERC was flawed in both its methodology and its conclusions, and that there is a lack of data on the consequences of an accident or act of sabotage involving tankers carrying LNG. ABS also found that the previous study, by Quest, underestimated both LNG vapor cloud dispersion distances and thermal radiation zones associated with major LNG release events.¹³

The report concluded that if the tanker's hull and cargo tanks were successfully breached, a pool fire could burn victims up to 4,600 feet away. Such an event could cause "severe pain" within 13 seconds and third-degree burns within 50 seconds. The report only analyzed the effect of a 20 percent loss of LNG, even though scientists are concerned that any breach of the hull would result in a total loss of the cargo. The safety zone required for a full breach of the tanker would likely be several miles.

It is critical that the Mexican Government, the State of California and FERC expand their LNG siting considerations to include this new evidence. Though tankers are the most vulnerable aspects of the LNG supply chain, current U.S. and Mexican regulations do not require safety zones for tanker accidents or acts of terrorism. Despite this, it is not clear whether FERC will apply the ABS recommendations to currently proposed LNG terminal sites, or whether multinational corporations operating in Mexico would adopt those regulations.

Who will protect LNG facilities in Mexico?

There is concern in Mexico about who will pay for security precautions. These costs are growing quickly in the U.S, where communities are paying up to millions of dollars per year for tanker and terminal security. Manuel Bartlett, a PRI senator, Cuauhtemoc Cardenas, a founding member of PRD, and other politicians warn, "Mexico will be forced to provide security for a project that will be part of the U.S. energy system."¹⁴ They also "contend the [Chevron-Texaco] project would violate Mexico's sovereignty and compromise its national security."¹⁵

The cost of protecting each LNG shipment to Boston, the only LNG receiving plant in an urban area in the United States, is about \$80,000 per tanker. This includes a contribution of about \$30,000 per tanker from the surrounding communities and the state.¹⁶ The cost of this protection has been rising as the measures become more extreme, matching the increasing fear of attack. Currently, safety measures include "maritime patrol boat escorts, helicopters, police divers, fire fighting tug boats, and the closing of the Tobin Bridge - the U.S. Route 1 commuting expressway, which LNG ships clear by less than 10 feet. In addition, Massachusetts State Police cruisers are placed strategically along the shore to watch for possible land-based missile attacks."¹⁷

In the United States LNG facilities are considered "critical assets" that warrant special protection. For this reason, Senator John F. Kerry, the Democratic Presidential candidate, is pressuring Secretary of Homeland Security Tom Ridge to raise the terrorist threat level from elevated to high in Boston when weekly LNG tankers enter the port in Everett. "The Everett LNG facility should be considered a critical asset that warrants

enhanced protective measures consistent with those implemented when the threat level was elevated to Orange in December 2003," Kerry wrote.¹⁸

Despite the precautions taken with the LNG facilities in the USA, little planning has been done regarding how to safeguard the proposed LNG sites in Baja California. The double standard generally evident in the decision to build dangerous facilities in Mexico, after they have been refused by local opposition groups in multiple U.S. states including Louisiana, Maine and California, is especially evident when the security of the sites is scrutinized. Neither Shell/Sempra nor Chevron-Texaco outlines any security plan relevant to the threat of a terrorist attack on the proposed sites in Baja California. In contrast to the degree of concern over the existing LNG sites in the U.S, the lack of analysis and foresight regarding the proposed sites in Baja California indicates an increased risk of terrorist attack and demonstrates a lack of responsibility and concern from Shell/Sempra and Chevron-Texaco.

Mexico has a history of fuel storage accidents

Historically, fuel storage in Mexico has been risky business. In 1984, over 500 people were killed in an explosion at liquid petroleum gas (LPG) terminal in Mexico City. The same LPG terminal experienced a second failure in 1996; four more lives were lost.

LPG is not the only fuel to have caused a tremendous loss of life in a Mexican City. A leak of hexane from a PEMEX operated factory in Guadalajara, Mexico devastated the area. Over 20 city blocks were flattened by blasts from the series of explosions.¹⁹ As a result of this explosion, 15,000 people were left homeless, at least 1,500 people were injured and 170 people were killed.²⁰ Natural gas has also been the source of a deadly explosion in Mexico. In 1996, a natural gas leak caused an explosion that killed 6 people and injured 30.

The history of fuel storage explosions in Mexico is long and deadly. It has not been one specific form of fuel that has caused these deaths, but many different non-renewable energy sources. Shell, Sempra, Chevron-Texaco and PEMEX state that LNG is a safer energy source, despite recent accidents in Algeria and the potential for terrorist attacks. Each of these previous sources of energy has been touted as "safe" and the results have been deadly.

Offshore LNG facilities still require security

Even offshore LNG facilities, while not posing an imminent safety hazard, will require extensive security measures because of the economic consequences of an attack on a facility that supplies such a large volume of Southern California's natural gas. According to the U.S. Congressional Research Service:

Offshore oil and gas facilities...have been attacked in the past during wartime and in territorial disputes. Since September 11, 2001, international concern about terrorist attacks on these platforms has grown.

Some experts believe terrorists attacks against offshore platforms have been on the rise recently in countries with a history of terror activity.... Because offshore oil and gas facilities are remote, isolated, and often lightly manned, some experts believe they are more vulnerable to terror attacks than land-based facilities....if several new offshore terminals were attacked in the future, the effects on natural gas availability and prices could have serious consequences for U.S. energy markets.²¹

LNG facilities in Mexico would be a terrorist target only because they are supplying a large amount of natural gas to the United States. Although it is not clear right now that Mexico will use any significant amount of natural gas from these facilities, it is possible that Baja California could become dependent upon natural gas once an LNG receiving terminal is built. The dependency of both the United States and Baja California on natural gas would dramatically increase the value of the site as a terrorist target. If an LNG receiving terminal were attacked, the economic and social consequences would be severe. The industry standard given for restoring a LNG receiving terminal to functional capacity is four years. Dependency on the centralized power of LNG creates a tremendous opportunity for terrorists to strike and cause lasting chaos in both the United States and Mexico.

¹ Raines, Ben. "Report Sheds New Light on LNG Blast in Algeria." *Mobile Register* April 14, 2004.

² Daniel, Mac. "Fire Officials Voice Concerns on LNG Threat." *The Boston Globe* February 27, 2004.

³ Fenske, Sara. "Welcome to Fire Island." *Houston Press* May 27, 2004.

⁴ Bender, Bryan. "US feared 9/11 hit in Boston, book says: LNG site in Everett was considered at risk," *Boston Globe*, March 23, 2004.

⁵ Paformak, Paul W. "Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress," Congressional Research Service, Library of Congress, September 9, 2003.

⁶ Ibid

⁷ Ibid

⁸ Finch, Bill. "Poll finds growing opposition to LNG Majority in Mobile and Baldwin counties against terminal in Mobile Bay," *Mobile Register* March, 2004.

⁹ LNG Watch: "Samoa LNG: What is it?" February, 2004.

¹⁰ *Energy Security*, January 21, 2004.

¹¹ Ibid

¹² Hearing before the Subcommittee on Energy Policy, Natural Resources and Regulatory Affairs, U.S House of Representatives testimony, June 22, 2004.

¹³ ABS found that in the scenario most often cited as a sample tanker sabotage case, a flammable LNG vapor cloud could travel as far as 18,000 feet (over three miles) before dissipating, and that thermal radiation from an LNG pool fire at the tanker could cause second-degree burns at a distance of 4,600 feet within 30 seconds. Available from <http://www.ferc.gov/industries/gas/indus-act/lng-model>

¹⁴ Lindquist, Diane. "LNG Controversy Heating Up: Mexico's opposition leaders criticize plans for terminals off Baja." *San Diego Union Tribune* April 7, 2004.

¹⁵ Ibid

¹⁶ Paformak, Paul W. "Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress," Congressional Research Service, Library of Congress, September 9, 2003.

¹⁷ Howland, Jonathan. *JINSA* April 1, 2004.

¹⁸ Bryan Bender, "U.S Feared 9/11 Hit in Boston, Book Says." *The Boston Globe* March 23, 2004.

¹⁹ Staten, Clarke EMT. "Explosions rip Mexican City" *Emergency News Net*, April 22, 1992.

²⁰ Eisner, Peter. "Mexico Reels from Explosion" *Newsday* April 24, 1992.

²¹ Paformak, Paul W. "Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress," Congressional Research Service, Library of Congress, September 9, 2003.